

REMARKS

The claims stand as previously submitted on December 3, 2007.

Applicant respectfully traverses the Examiner's rejection of claims 224-242. See pages 2-11 of the Action mailed February 22, 2008. Applicant respectfully requests that the Examiner reconsider the rejections of the pending claims in the application, taking into consideration the following arguments and expanded analysis of the cited prior art, namely U.S. patent 5,870,484 to Greenberger (hereinafter "Greenberger" or "the '484 patent").

Greenberger discloses a system whereby the sound is beamed in a direction away from the loudspeaker with the delayed signal. The Examiner rejects claims 224-236 and 238-242 as being anticipated by the '484 patent under 35 U.S.C. 102(a). The Examiner rejects claim 237 as being obvious from the '484 patent under 35 U.S.C. 103(a). However, since the following limitation is recited in each the present independent claims, namely 224, 232 and 239, Applicant respectfully submits that all claims in the present application are novel and non-obvious with respect to Greenberger.

This is because the aforesaid claims include the recitation:

"such that replicas for transducers closer to the respective position in space are delayed more than replicas for transducers further from the position in space".

The Examiner indicates that column 11, line 16 to column 12, line 2 of Greenberger disclose this recited feature. This passage describes delay gradient loudspeakers. Two loudspeakers are provided quite close together, and the signal is routed through one of the loudspeakers normally but is delayed and inverted before being routed through the other loudspeaker. A cardioid radiation pattern is produced, as shown in Figure 1b (see Greenberger, column 12, lines 37 to 39).

As shown in Figure 1b of Greenberger, the sound field is much stronger at a position furthest from the delayed element (i.e. on the right-hand side in Figure 1b) than it is for positions closer to the delayed element. As shown in the top left part of Figure 1b, the signal to the left-hand loudspeaker is delayed and inverted whereas the signal to the right-hand loudspeaker is not modified. This causes the cardioid pattern shown, in which very little energy is directed to the left and the great majority of the energy is directed to the right. This pattern is in fact explained in Greenberger at column 12, lines 8 to 13:

"The main radiation lobe of a first order D-Grad gradient loud speaker will be oriented along the line joining the centers of the two radiating elements. The direction of maximum radiation will be pointing from the midpoint of the line joining the centers of the elements toward the non-delayed element for any condition of non-zero delay."

Accordingly, Greenberger discloses that the maximum radiation points

toward the non-delayed element. Indeed, this is shown in Figure 1b of Greenberger and is the well-known effect of the dipole arrangement disclosed in Greenberger. Accordingly, Greenberger discloses a system in which the sound energy is provided in a direction corresponding to the non-delayed element. As the sound energy is directed to the respective position in space it can be said that in the Greenberger device, the signals closer to the respective position in space are delayed less than the signals further from that position in space.

The Examiner refers to Figure 13a of Greenberger. This figure shows the system when both a left signal and a right signal are to be emitted. As the system is linear, the left and right signals can be considered separately. The illustrations on page 10 of this Response show the signal processing that is applied to the left and the right signals respectively.

In the first figure on page 10, the system processing in respect of the left-hand signal L is shown. As disclosed in Figure 13a of Greenberger, the left signal is supplied to the left transducer in an unmodified form. The left signal is also delayed and inverted before being supplied to the right transducer. In accordance with Figure 1b of Greenberger, this provides the cardioid sound pattern shown on page 10 of this Response. The sound energy is directed to the left and, accordingly, the respective position in space is labeled P₁ at the left-hand side. It can be seen from this figure that the signal supplied to the transducer that is closer to the respective position in space P₁ (i.e. the signal supplied to the left-hand transducer) is not delayed, whereas the signal supplied to the transducer further from the position in space P₁ is delayed. Accordingly, in respect of the left-hand signal, Greenberger does not disclose signals for transducers closer to the respective position in space being delayed more than the signals for transducers further from the respective position in space. Greenberger can be seen to disclose quite the opposite.

At the bottom of page 10 of this Response, the system processing in respect of the right-hand signal R is shown. It is a mirror image of the processing for the left-hand signal. Again, the respective position in space P₂ is closer to the transducer having the non-delayed signal than it is to the transducer having the delayed signal. The system of Figure 13a of Greenberger is just the linear superposition of the two diagrams on page 10. Accordingly, the left-hand channel will be directed left and the right-hand channel will be directed right as shown on page 10.

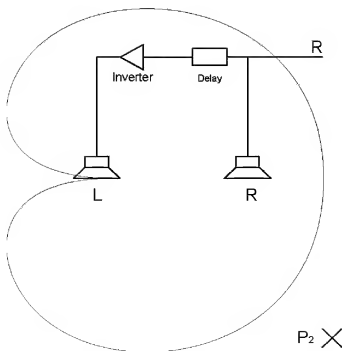
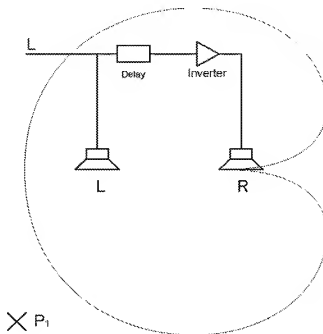
In responding to Applicant's previous arguments, the Examiner states:

"It is well known that for in order to have sound emitted from two separate sources of varying distances reach a virtual point at the same time, the emitted sound must be delayed accordingly. An emitted sound that has less distance to travel must have a greater delay than more distant sources. Such a system of delaying is accomplished by the disclosure of Greenberger."

[Examiner's Action, page 10, last two lines and page 11, first three lines.]

Applicant respectfully submits that the Examiner bases his position on a misleadingly incomplete understanding of the workings of the Greenberger

device. The Examiner correctly understands that in the present application, the signals emitted closer to the position in space are delayed more than the signals further from the position in space and draws the conclusion that because Greenberger directs signals towards the position in space, it must work in the same way as the present invention.



But this analysis fails to take account of Greenberger's teaching of inverting signals. Accordingly, when an unmodified signal and an inverted signal reach any point in space at the same time, they tend to cancel one another out. In contrast, in the present invention, when two unmodified signals, neither of which is inverted, reach a position in space at the same time, the sound energy is doubled. Accordingly, the effect in the present invention of the sound energy being added cumulatively when two signals reach a position in space at the same time does not occur in Greenberger because Greenberger relies on the simultaneous arrival of two signals for cancellation of the sound energy at that point.

Applicant submits that the Examiner incorrectly surmises that signals closer to the respective position in space must be delayed more than signals further from the respective position in space in order to direct sound towards that position. This is only true in the present invention. In Greenberger, because of the signal inversion, signals closer to the position in space must in fact be delayed less than signals further away. The key passage of Greenberger is at column 12, lines 8 to 13, where it explicitly recites that the direction of maximum radiation will be towards the non-delayed element. This is precisely the opposite of what is taught and claimed in the present application.

There is no reason that a worker in the art would find it obvious to modify Greenberger so as to create a system that falls within the current claims. In particular, Greenberger places much emphasis on the dipole pattern of radiation that is achieved by using an unmodified and inverted signal. All of the very many embodiments of Greenberger require signal inversion in order to obtain the sound effects, which are stated to be very good. Accordingly, it would be an *ex post facto* analysis to state now that the skilled person would have dispensed with the signal inversion and delayed the signal closer to the position in space more than the signal further from the position in space. There is just no teaching in the art that this would provide any benefit. Any rejection of the claims in the light of Greenberger would improperly be based on hindsight.

CONCLUSION

Accordingly, Applicant requests that the Examiner reconsider the rejection and pass this case to issue. If he has any questions or believes that the matter may be advanced by speaking with Applicant's attorney, he is invited to phone the undersigned.

Respectfully submitted:

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